

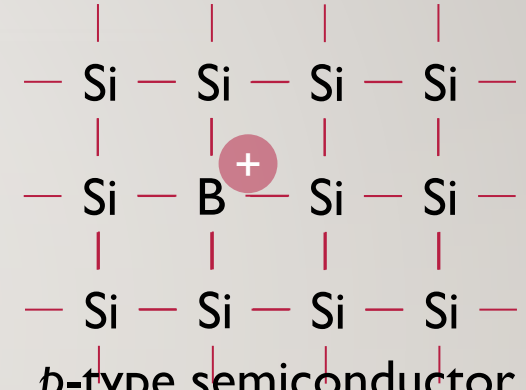
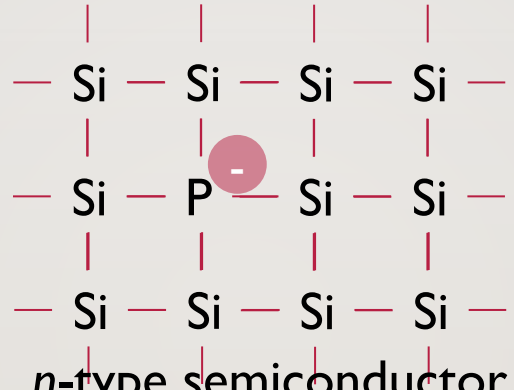
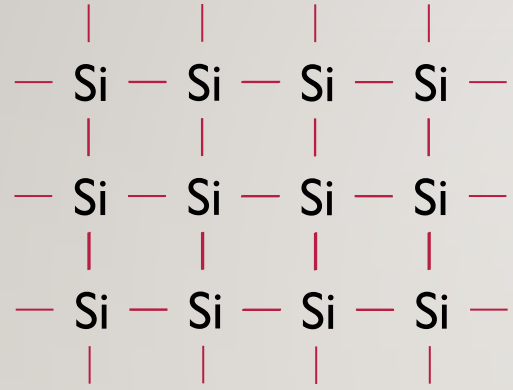
# WEEK01 – COMPUTER HARDWARE

---

WEN-BIN JIAN

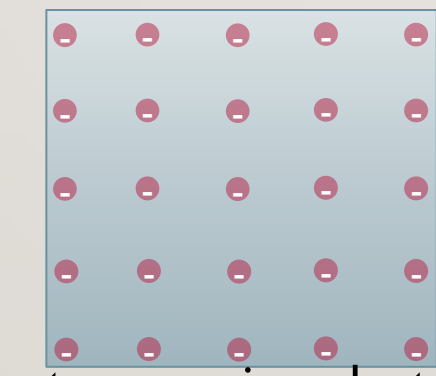
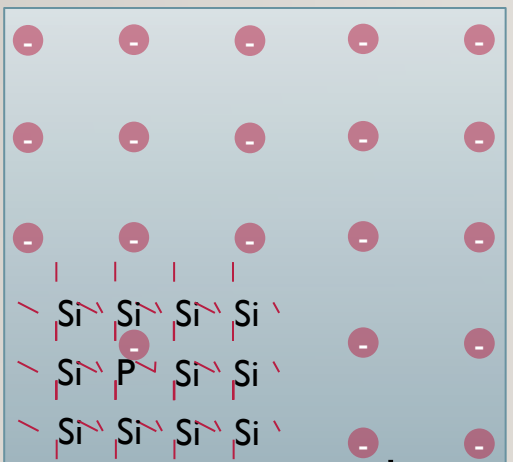
DEPARTMENT OF ELECTROPHYSICS, NATIONAL CHIAO TUNG UNIVERSITY

# N-TYPE/P-TYPE SEMICONDUCTORS, DOPING



*n*-type semiconductor  
electron doping

*p*-type semiconductor  
hole doping



*n*-type  
 $10^{16}$ - $10^{18}$   
 $\text{cm}^{-3}$



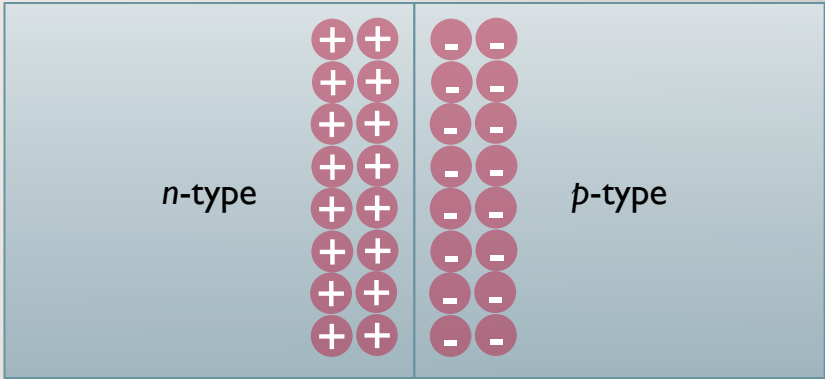
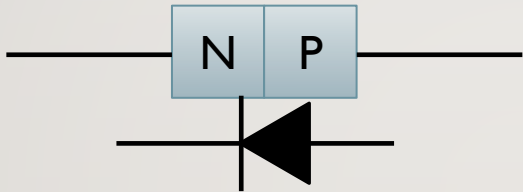
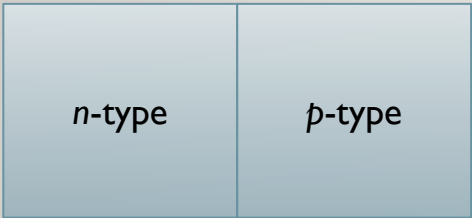
*p*-type

*n*-type semiconductor  
electron doping

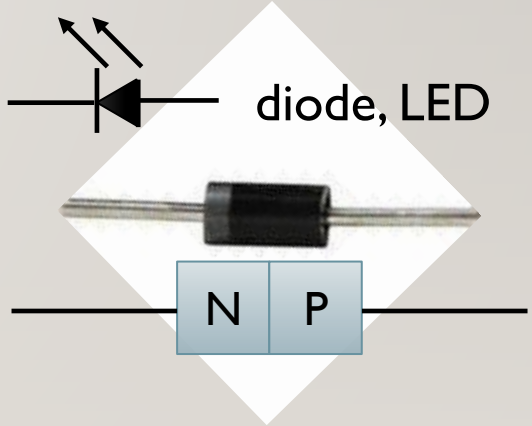
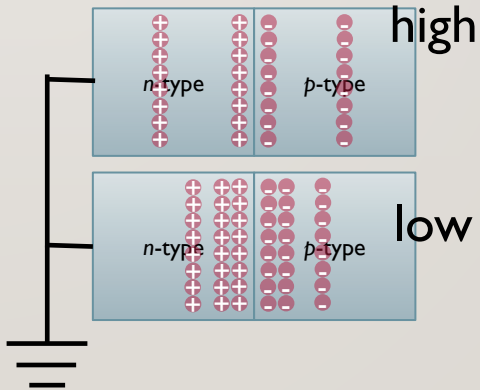
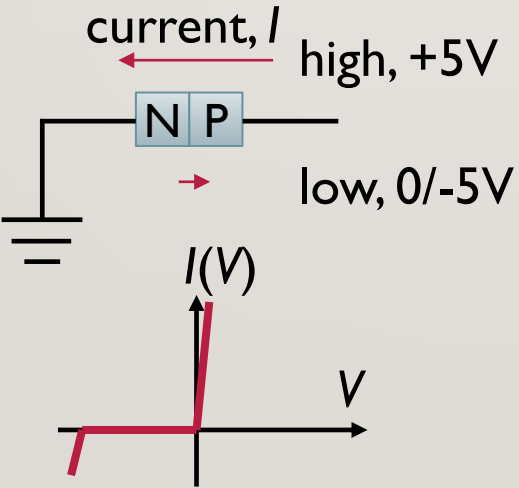
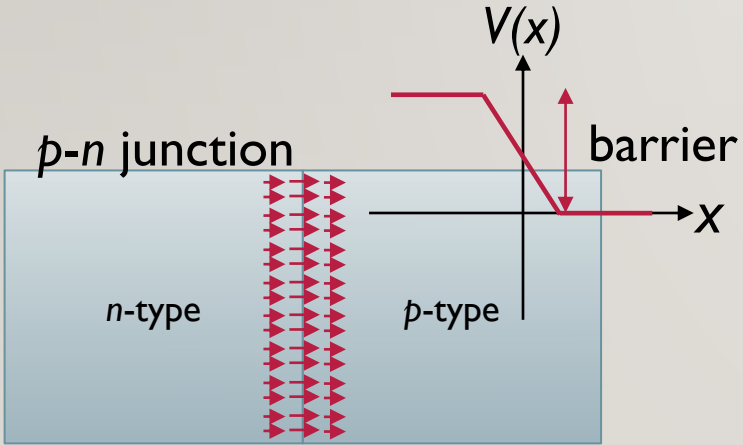
*n*-type semiconductor  
neutralized

*p*-type semiconductor  
neutralized

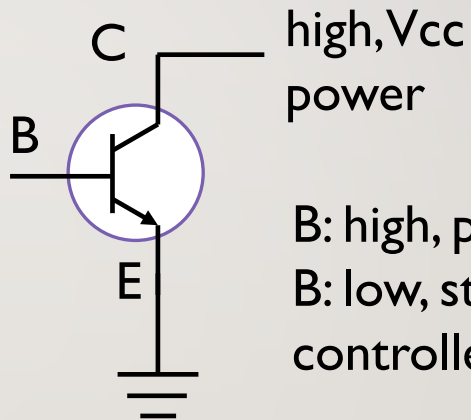
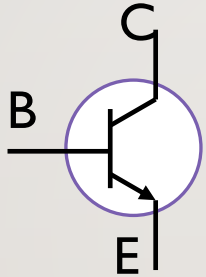
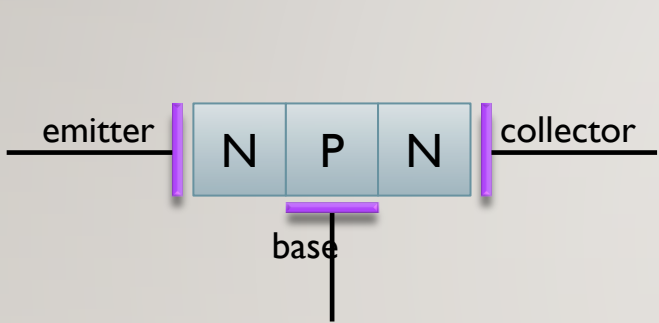
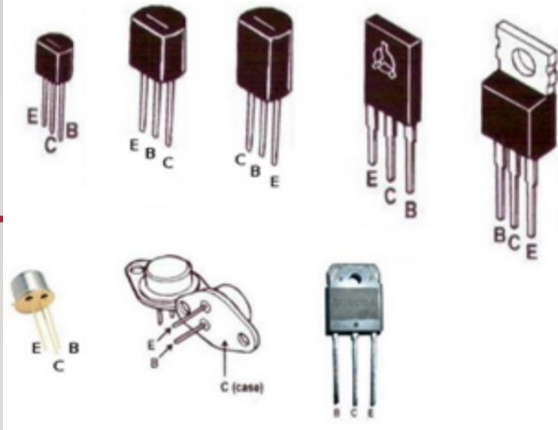
# SEMICONDUCTORS - DIODES



Voltages: high, low, ground

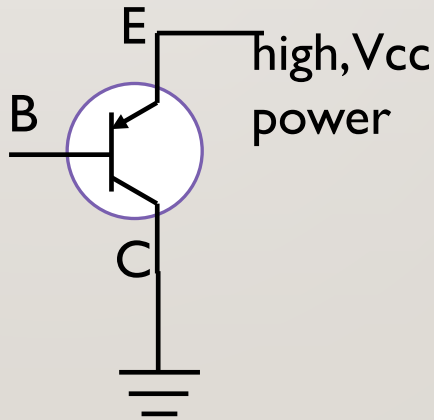
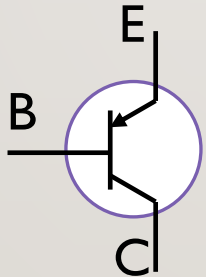
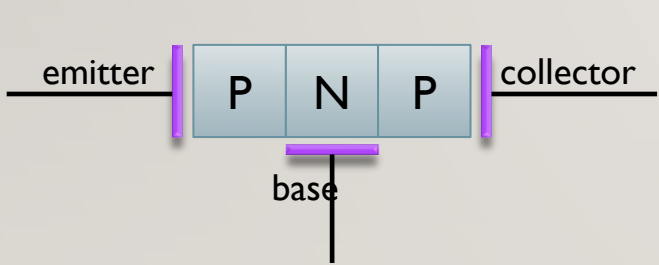


# CONVENTIONAL TRANSISTORS – BIPOLAR JUNCTION TRANSISTORS (BJT)



high, Vcc  
power

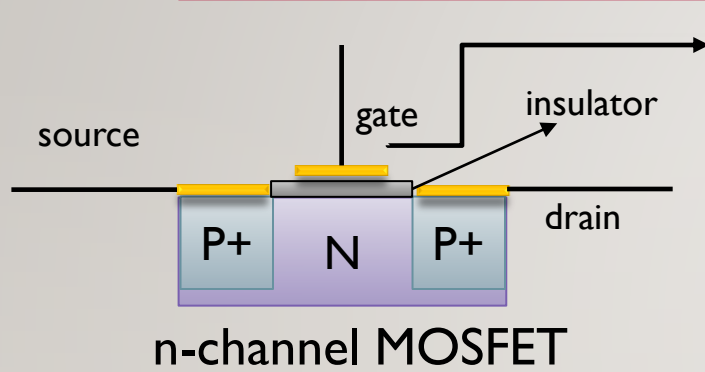
B: high, pass  
B: low, stop  
controlled by the BE resistance



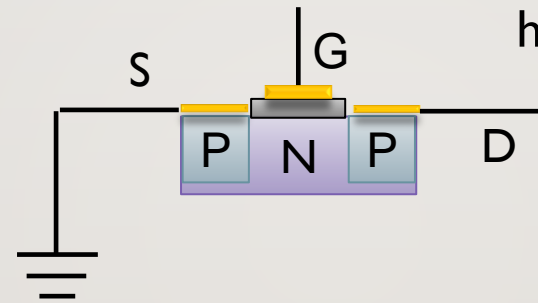
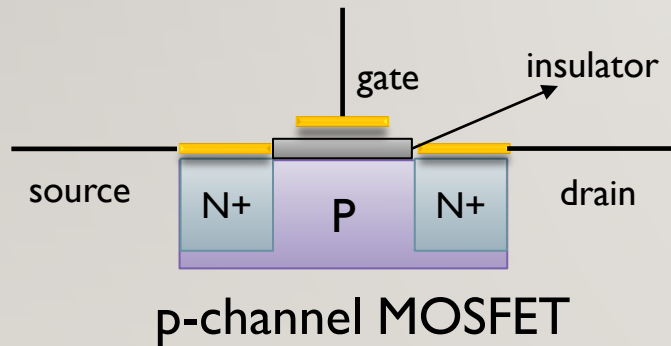
high, Vcc  
power

B: high, stop  
B: low, pass  
controlled by the BE resistance

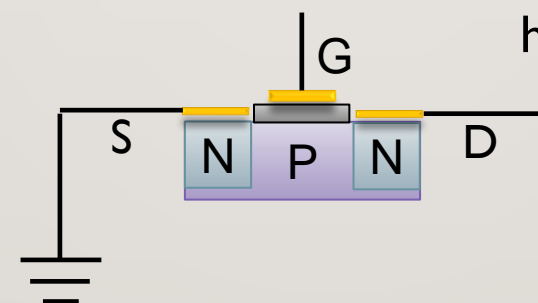
# MODERN TRANSISTORS – MOSFET



controlled by electric field

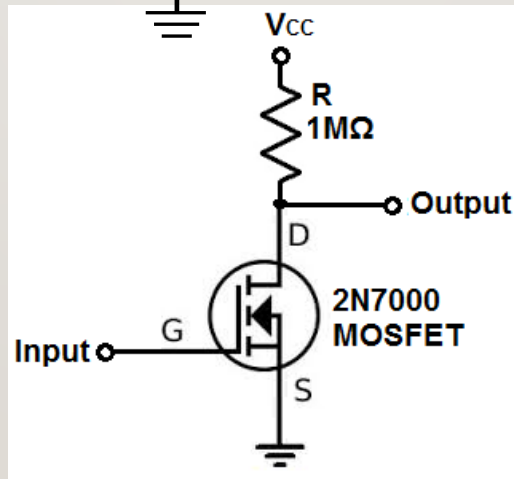
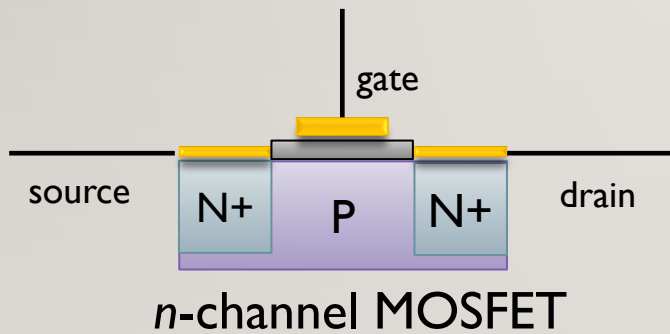
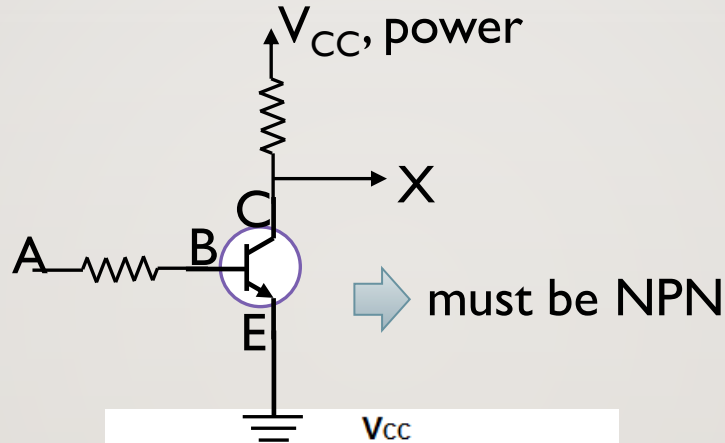
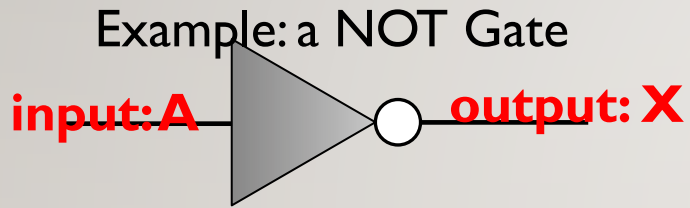


$V_G$  high: stop  
 $V_G$  low, negative: pass  
 $V_G$  used to control the SD carrier concentration, resistance



$V_G$  high: pass  
 $V_G$  low, negative: stop  
 $V_G$  used to control the SD carrier concentration, resistance

# LOGIC GATES



	State 1	State 2
$V_{CC}$	+5V	+5V
$V_E, V_S$	0V, ground	0V
$V_B, V_G$	+5V	0V
$V_C, V_D$	0V	5V

A	X
0	1
1	0